Abstract of the Disclosure

An improvement to chemical-mechanical polishing. The improvement includes using a buffing pad having a geometrically optimized shape along with optimizing the buff head diameter, offset *O* and overlay *L*. In one embodiment, the buffing pad is smaller than the buff head and is mounted eccentrically. In another embodiment, the buffing pad has a generally square outer shape. In another embodiment, the buff pad is circular and is the same size as the circular buff head. In another embodiment, the buffing pad has at least three radially extending arms. The optimal configuration is determined iteratively for a selected process by changing the buffing pad shape, buff head diameter, the offset and the overlay. For example, increasing the offset generally tends to increase the removal rate toward the edge of the wafer. Increasing the overlap generally tends to increase the removal rate toward the center of the wafer. Removing portions of the buffing pad near the pad's edge tends to decrease the removal rate over the entire wafer radius but more so near the center and the edge of the wafer. By empirically testing various configurations, the optimal configuration can be found for a particular application.

The invention further provides a method of chemical-mechanical polishing of a semiconductor device utilizing a combination of polishing steps, including a first polishing step on a primary polish station using a first slurry and a second polishing step on a buff station using a second slurry. The method may be used on a material layer, such as copper or tungsten, deposited over a barrier layer covering a dielectric layer. The first polishing step is stopped after the material layer has been substantially removed and the second polishing step is stopped after the barrier layer has been substantially removed. An end-point detection system may be used to determine when the material and barrier layers have been substantially removed.